THE SIX SIGMA SYSTEM IN RELATION TO THE BUSINESS' STRATEGY AND PRIORITIES

Drăgoi Ionuț
The Faculty of Economics and Business Administration The West University of Timisoara

David Marcel
The Faculty of Economics and Business Administration The West University of Timisoara

Boldea Monica
The Faculty of Economics and Business Administration The West University of Timisoara

Now more than ever, corporations the world over are scrambling to redefine the processes, techniques, and strategies they need to survive in an age of uncertainty. Businesses today seek an effective corporate performance measurement system to maximize the bottom line. With the advent of the Internet, ongoing globalization, and standardization in management systems, business leaders must focus on how to measure performance to monitor their continued viability and success. Many existing performance measurement systems were designed to support business practices and to monitor progress. With shrinking margins and competitive pressures, however, corporate performance measurement systems must do more than monitor. They must identify opportunities for optimizing profitability and growth, without pitting one against the other. The idea is to use performance measures to add value, instead of simply measuring for a formality.
The Six Sigma method is not only a trendy "new solution", it is not a business whim linked to a single method or strategy – the study trying to draw attention to the fact that Six Sigma is a flexible system to improve the management and the performance of companies. The research paper seeks to demonstrate that the Six Sigma method refers to both the passion for customer service and a drive for new ideas, and to statistics and processing numbers, finding application in the fields of marketing, services, human resources, finance and sales, as well as in production and engineering.

Key words: Six Sigma method, quality, performance measurement, profitability, growth
JEL: M10, L21, O43

Introduction

In any industry, organization, or daily process, when one doesn't know what one doesn't know, it's going to cost him. For too many organizations the costs (often hidden) of defects and waste in the way they operate are huge. Having processes in which errors occasionally occur may not seem such a big deal. But when one considers how many errors may be lurking in company-wide processes, the monetary impact on the overall productivity, customer satisfaction, and profitability multiplies dramatically.
The Six Sigma approach to managing is all about helping a manager identify what he doesn't know as well as emphasizing what he should know, and taking action to reduce the errors and rework that cost him time, money, opportunities, and customers. In other words, Six Sigma translates that knowledge into opportunities for business growth.

1.What is Six Sigma?

A way to define the Six Sigma method is as a general effort for „changing organizational culture" to drive the company towards better customer satisfaction, profitability and competitiveness. The Six Sigma scale and flexibility - as a way to improve performance – is, however, best reflected by its definition as „a comprehensive and flexible system for achieving, sustaining and

maximizing business success. Six Sigma is driven only by close understanding of customer needs, disciplined use of facts, information and statistical analysis, and special attention paid to management, improvement and business process modeling "(Pande, Neuman, Cavanagh, 2009)
Many companies believe that dealing with errors is just part of the cost of doing business. But not every manager has to accept that faulty logic. With Six Sigma, the manager can eliminate most errors, reduce the costs, and better satisfy the company's customers.
Six sigma is a statistical concept that measures a process in terms of defects. Achieving six sigma means the processes are delivering only 3.4 defects per million opportunities (DPMO) - in other words, they are working nearly perfectly.
Sigma (the Greek letter ó) is a term used in statistics to represent standard deviation, an indicator of the degree of variation in a set of measurements or a process. In its business use, it indicates defects in the outputs of a process, and helps us to understand how far the process deviates from perfection. A sigma represents 691462.5 defects per million opportunities, which translates into a percentage of non-defective outputs of only 30.854%. That's obviously really poor performance. If we have processes functioning at a three sigma level, this means we're allowing 66807.2 errors per million opportunities, or delivering 93.319% non-defective outputs. That's much better, but the company is still wasting. The Six Sigma methodology collects data on variations in outputs associated with each process, so that it can be improved and those variations reduced, being a statistical concept that measures a process in terms of defects - at the six sigma level, there are only 3.4 defects per million opportunities.

Sigma Level (Process Capability)	Defects per Million Opportunities
2	308,537
3	66,807
4	6,210
5	233
6	3.4

Figure no.1. The sigma conversion table

We can see from the conversions above that the sigma scale is exponential. It may seem like three sigma is good enough. After all, if there are 66,807 defects out of a million, that means that 933,193 things went well—93.319% perfection. The question is, how many customers can any business afford to lose? How much money can any company afford to lose because of mistakes? Why accept it as normal to be running processes at only three sigma or four sigma when, by changing the way one manages the processes, they could get a lot closer to six sigma and all the resulting benefits.
Six Sigma uncovers the layers of process variables - in data terms - that one must understand and control to eliminate defects and wasteful costs. It's a management approach that aims to achieve the apex of quality by measuring, analyzing, improving, and controlling processes to root out defects and boost bottom-line results.
Six Sigma is about practices that help the company eliminate defects and always deliver products and services that meet customer specifications. The sigma level of a process is calculated in terms of the number of defects in ratio to the number of opportunities for defects. Six Sigma is also a philosophy of managing that focuses on eliminating defects through practices that emphasize understanding, measuring, and improving processes, money and customer satisfaction. The central idea of the Six Sigma approach is that if one can measure the defects in a process, one can systematically figure out ways to eliminate them, to approach a quality level of zero defects. So, in short, Six Sigma is several things:

-A statistical basis of measurement;
-3.4 defects per million opportunities;
-A philosophy and a goal: as perfect as practically possible;
-A methodology;
-A symbol of quality

2. TQM to Six Sigma

Many people associate Six Sigma with the quality movement. How does Six Sigma differ from the "quality" programs the company may have already experienced? No understanding of the quality movement would be complete without mentioning the visionary W. Edwards Deming, best known for helping the Japanese revitalize their industries after World War II. His approach was radically new and had significant impact on the evolution of quality and continuous improvement programs in organizations around the world. It is fair to say that Deming's management approach, which came to be known as Total Quality Management or TQM (though Deming didn't like that term), has changed the way thousands of companies conduct their operations. Total Quality Management (TQM) approach focused on the organization as a system, with an emphasis on teams, processes, statistics, continuous improvement, and delivering products and services that meet and exceed customer expectations. Six Sigma is a disciplined extension of TQM.

By the mid-1980s, the extent to which corporate management was focusing on quality was significant; businesses adopting TQM underwent a major paradigm shift, a transformation of "unlearning" everything previously believed about business to create better products and services.

They began to understand that quality did not require higher costs but more efficient and reliable processes that delivered defect-free outputs and that they had to focus on process improvement and customer satisfaction. TQM is an excellent foundation from which to build toward the next level of quality management, represented by the Six Sigma approach.

But Six Sigma is far more than the latest "quality" trend. The proof? Companies that have implemented Six Sigma have achieved outstanding financial results and developed a disciplined, pragmatic plan for improved financial performance and growth. Companies such as Motorola, Texas Instruments, IBM, Allied Signal, and General Electric have successfully implemented Six Sigma and reduced costs literally by billions of dollars. More recently Ford, DuPont, Dow Chemical, Microsoft, and American Express have started working on instituting the Six Sigma methodology. But it's about more than money.

Jack Welch, the CEO who started Six Sigma at General Electric, called it "the most important initiative GE has ever undertaken," and said that Six Sigma is "part of the genetic code of our future leadership." Six Sigma was also conceptualized as a quality goal in the mid 1980s at Motorola because technology was becoming so complex that traditional ideas about acceptable quality levels were inadequate. As the number of opportunities for defects increases, the percentage of perfection must rise; so, in 1989 Motorola announced a five-year goal—a defect rate of not more than 3.4 parts per million - six sigma. This initiative challenged ideas of quality in the U.S. and changed the concept of quality levels. It was quickly no longer sufficient to measure quality as percentages (defects per hundred opportunities). Now the bar was raised, to measure defects per million or even per billion.

„Six Sigma" is everything but a simple concept, Six Sigma is a system that encompasses many concepts, tools and principles. The examples derived from the experience of several successful companies that have implemented the Six Sigma method reflects several benefits which attract companies towards implementing this method: it generates lasting success, provides a

performance target for each, added value for customers, accelerates the rate of improvement, promotes cross-sector learning and exchange of experience, and implements strategic change.

3.The Six Sigma Methodology – the DMAIC approach

The Six Sigma methodology uses statistical tools to identify the vital few factors, the factors that matter most for improving the quality of processes and generating bottom-line results. Six Sigma statistical tools work like magic to uncover what one doesn't know. Yet no one has to be a statistician to use them: you focus on selecting tools, using them, and analyzing data and let the specific software do the calculations.

The five-phase process of DMAIC uses a collection of tools and is a logic filter which leads to the vital few factors affecting the outcomes of the process:

Define - Determines the project goals and deliverables to customers (internal and external).

Measure - Identifies one or more product or service characteristics, maps the process, evaluates measurement systems, and estimates baseline capability.

Analyze - Evaluates and reduces the variables with graphical analysis and hypothesis testing and identifies the vital few factors for process improvement.

Improve - Discovers variable relationships among the vital few, establishes operating tolerances, and validates measurements.

Control - Determines the ability to control the vital few factors and implements process control systems.

In other words, the Define phase sets the targets for the Six Sigma project, the Measure and Analyze phases characterize the process, and the Improve and Control phases optimize the process and then maintain it.

Process variation exists in every transaction, department, and business unit. From the micro to the macro perspective, using Six Sigma methods allows you to define goals and set specifications, measure process characteristics and estimate baseline capability, analyze the variables and identify the vital few factors, improve the process, and control the vital few factors and implement process control systems.

Using the DMAIC approach, one can dig out waste and return hidden dollars to the company's bottom line.

We should note that Six Sigma methodology is not rigid. Approaches vary, sometimes significantly. One of the variations is in the phases: some approaches use all five of the phases listed above, while others do not include the Define phase.

Six Sigma professionals recognize that this approach is a kind of roadmap for improvement, and it doesn't matter if it's called DMAIC, MAIC, PCOR (from the Air Academy - prioritize, characterize, optimize, and realize), GETS (from GE Transportation Systems - gather, evaluate, transform, and sustain).

The point is that this is a set of tools aimed at helping managers and employees understand and improve critical processes.

Six Sigma is based on a few key concepts: Defect; Variation; Critical-to-quality; Process capability; Design for Six Sigma. Six Sigma focuses on defects and variations. It begins by identifying the critical-to-quality (CTQ) elements of a process— the attributes most important to the customer. It analyzes the capability of the process and aims at stabilizing it by reducing or eliminating variations.

Vital few factors are those that directly explain the cause-and-effect relationship of the process output being measured in relation to the inputs that drive the process. Typically, data shows that there are six or fewer factors for any process that most affect the quality of outputs in any process, even if there are hundreds of steps in which a defect could occur - the vital few. When

one isolates these factors, it becomes clear what basic adjustments are needed to be made to most effectively and reliably improve the outputs of the process.
Simply put, Six Sigma management is about tying quality improvement directly to financial results. The Six Sigma goal is to link internal processes and systems management to end consumer requirements. Six Sigma is a scientific approach to management, driven entirely by data. The Six Sigma methodology eliminates the use of opinion - "I think," "I feel," or "I believe." Six Sigma drives the organization to a more scientific means of decision making by basing everything on measurable data.

4.Focus on Engaging People and Changing Processes

Another thing to know about Six Sigma is that it doesn't rely on the latest program fads or "magic pills" to fix organizations. It relies on old-fashioned hard work coupled with factual data and a disciplined problem-solving approach. It affects every aspect and level of an organization - from line workers to middle managers to CEOs - to transform the company's people and its processes.
The question is "What can the process deliver?" Process capability can be seen as a statistical measure of inherent variation for a given event in a stable process. It's usually defined as the process width (normal variation) divided by six sigma and quantified using capability index (Cp). More generally, it's the ability of the process to achieve certain results, based on performance testing.
As the first step in that transformation, the Six Sigma mindset considers the company and its people as assets, rather than as costs (liabilities); they are as much an asset as any piece of capital equipment, and they represent an investment with extraordinary potential for return.
Shifting the perspective on people from liabilities to assets (or investments) is fundamental to Six Sigma. Once thinking in terms of "human assets," it's equally important to realize the underlying monetary value of rooting out wasted materials and steps in processes, as this is critical to unlocking the hidden return on the company's investment in people. And that's also another aspect of the Six Sigma approach to managing. The fact is that work gets done through processes executed by people; both successes and problems are usually the result of what lots of people do, not just one person. If one doesn't pay careful attention to both people and processes, improvement will not happen.
An easy way to understand the concept of human assets is to calculate their individual return on investment (ROI). For example, if an employee costs the business 50,000 a year and his / her activity produces revenue of 100,000, the employee has covered the costs and raised an additional 100% - the profit or return. So, the annual ROI for that employee is 100%. By calculating employee ROI, one can focus on making the most of them as assets invested in the business. By changing the way we look at processes, by understanding the vital few factors that cause waste, error, and rework, we can improve the ability of our processes to deliver higher quality to our customers and to lower costs. Once we know which vital few factors to focus on, we can make improvements that deliver dramatic results.
And by putting employees to work at solving process problems with proven statistical tools, the manager can eliminate not only errors, but also inaccurate speculation about why processes don't work. Again, instead of opinion, the manager arms himself and his people with quantifiable information - based on facts, not hunches and guesswork. When he knows the facts, he is in a position to fix the problems permanently and gain long-term benefits. In other words, he has leveraged the power of knowledge to transform performance.

5.Conclusions

Six Sigma at many organizations simply means a measure of quality that strives for near perfection. Six Sigma is a disciplined, data-driven approach and methodology for eliminating defects (driving toward six standard deviations between the mean and the nearest specification limit) in any process - from manufacturing to transactional and from product to service.
Yet, Six Sigma is not another quality program. Businesses exist for one purpose - to profitably serve customers. So it follows that any problem-solving initiative should do the same. Six Sigma uses the company's resources to fix identifiable, chronic problems. It proves its value by connecting outcomes to the company's bottom line. Quality programs lay a valuable foundation in creating a quality mindset. Six Sigma is not theory. It's a practice of discovering the vital few processes that matter most. It defines, measures, analyzes, improves, and controls them to tie quality improvement directly to bottom-line results. Six Sigma is an active, involved effort that puts practical tools to work to root defects at all levels of the organization.
It is also no theoretical exercise. Since the success of Six Sigma is directly linked to monetary outcomes, it generates real-world results. It uses the most readily available resources in an organization - its human assets. That means that positive, tangible results consistently show up wherever and whenever people are engaged in implementing the method.
Six Sigma is not a training program. Of course, practitioners are trained in the methodology to ensure correct implementations and results. But Six Sigma is a business strategy that fosters a cultural shift at all levels. Permeating departments, functional groups, and all levels of management, Six Sigma changes the outlook and practices of everyone in the organization. From workers on assembly lines and bookkeepers in accounting to operations managers and human resource personnel, training exists only to instill the method, facilitate transformation, and get financial results by attacking chronic defects with proven statistical tools.
Six Sigma actively links people, processes, and outcomes in a rigorous, adaptable way to get you the results you're looking for. No matter the industry, business, product, or service, as you apply Six Sigma, you'll see the tangible results on your projects.
Six Sigma helps the company and the manager to identify what they don't know, indicates what they should know, and helps them reduce defects that cost time, money, opportunities, and customers.

6.Bibliography

Books
1.Bhote, Keki R. , *The Power of Ultimate Six Sigma*, AMACOM, USA, 2003
2.Hampden-Turner, Charles, *Corporate Culture - How to generate organizational strength and lasting commercial advantage*, Judy Piatkus Publishers Ltd, London, UK, 1994
3.Handy, Charles, *Understanding Organizations*, Penguin Books Ltd, London, 1993
4.Isaic-Maniu, A., Vodă V., *The Approach of Six Sigma, Interpretations, Controversies,Procedures,* the Economic Publishing House, 2008
5.Pande, Peter S., Neuman, Robert P.,Cavanagh, Roland R., *SIX SIGMA. Cum îşi îmbunătăţesc performanţele GE, Motorola şi alte companii de top*, Ed. ALL, Bucureşti, 2009
6.Peters, Thomas J., Waterman, Robert H., *In Search of Excellence*, Harper & Row, USA, 1980
7.Pyzdek, T., *The Six Sigma Handbook*, McGraw HillSchermerhorn, 2003
Journals
1.Cronemyr, P., *DMAIC versus DMADV Differences, Similarities and Synergies*, International Journal of Six Sigma and Competitive Advantage, vol.3, no.3/ 2007
Web sources
1.Motorola Six Sigma Services. Motorola University, 22 July 2002
http://mu.motorola.com/sigmasplash.htm, (accessed on 11.09.2010)
2.AlliedSignal Inc. 1998 Annual Report. Honeywell Inc. 22 July 2002

http://www.honeywell.com/investor/otherpdfs/ALD98.pdf, (accessed on 10.09.2010)
3. GE Investor Relations Annual Reports. General Electric Company. 22 July 2002 http://www.ge.com/company/investor/annreports.htm, (accessed on 12.09.2010)
4. Honeywell Annual Reports. Honeywell Inc. 22 July 2002 http://investor.honeywell.com/ireye/ir_site.zhtml?ticker=HON&script=700, (accessed on 12.09.2010)
5. Better Understand Six Sigma Plus With Honeywell's Special PowerPoint Presentation. Honeywell Inc. 22 July 2002 http://www.honeywell.com/sixsigma/page4_1.html, (accessed on 12.09.2010)